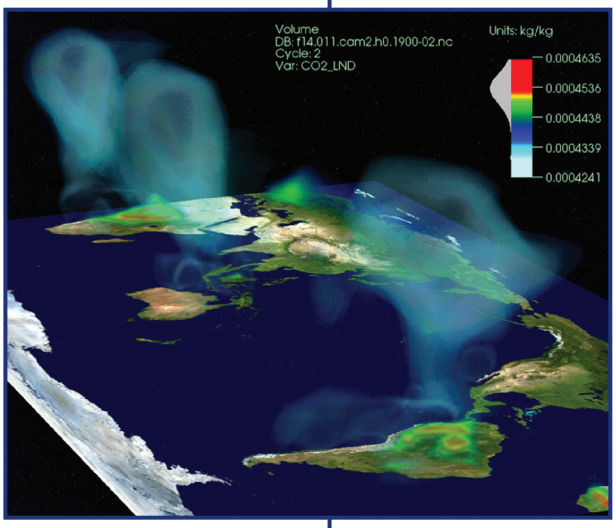
Scientists Shed Light on Climate Change

Scientists have established beyond serious dispute that the earth's climate is getting warmer.

While the change may seem modest—with the average temperature at the planet's surface rising about 0.75°C (or more than 1°F) over the last century—the potential consequences could be dramatic.



A snapshot of the simulated time evolution of the atmospheric carbon dioxide concentration that originates from the land's surface. Inez Fung, Jasmin John, and Forrest Hoffman Visualization by Jamison Daniel, NCCS

A project headed by Warren Washington of the National Center for Atmospheric Research is using the formidable computing resources of the National Center for Computational Sciences (NCCS) to increase the confidence of global climate analysis. In doing so, the project will provide information needed by residents and policy makers alike to address their changing climate.

The team contributed simulations for the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), sponsored by the United Nations. The reported concluded that there is more than a 90-percent chance that climate warming over the last 50 years has been the result of human activity.

The primary culprits are chemicals known as greenhouse gases because they cause the atmosphere to trap more of the sun's heat than it otherwise would. The most important greenhouse gas is carbon dioxide, which is primarily released through the burning of fossil fuels by power plants, industry, and vehicles.

Washington's team has already made substantial contributions to the field. It is responsible for the prominent Community Climate System Model (CCSM), which effectively simulates the effect of carbon dioxide on temperature across the planet. Future versions will simulate the entire carbon cycle, calculating emissions where they occur—at factories, power plants, and the urban settings where vehicles are concentrated—and modeling the journey of carbon dioxide in the atmosphere, forests, and the ocean.

The team goes into 2007 with an allocation of 4 million processor hours on the NCCS's Cray XT4 Jaguar supercomputer and 1.5 million processor hours on the center's Cray X1E Phoenix system.

The outcome will be of benefit not only to the dozens of leading scientists working on the project, but also to the scientific community in general.

"We think of the code that we're developing as an instrument," explained John Drake of the Oak Ridge National Laboratory (ORNL), chief computational scientist for the project. "No one can develop a climate model on their own anymore; it's just way too complicated."

Collaborations between researchers of the National Science Foundation and Department of Energy to develop version 3 of the CCSM are now extended through new partnerships with the National Aeronautics and Space Administration (NASA) and university researchers. The aim is achieving unprecedented simulations and concerted model development. The resulting next-generation climate model—CCSM4—will be used in the next IPCC assessment, scheduled in 5 years, which will explore the dynamics of the atmosphere, land, and ocean and their impact on the physical climate system.

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